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MEMO

To: Chip Humphrey and Kristine Koch, US Environmental Protection Agency (EPA), Region 10.

From: Paul Schroeder and Karl Gustavson, US Army Engineer Research and Development Center (ERDC)

Date: May 27, 2013

Subject: Review and Recommendations on Dredge Duration and Production Rates from the Portland Harbor Draft Feasibility Study.

DURATION OF DREDGING

Assumptions on dredging approaches have been developed in the FS to estimate the duration of activities. The duration of dredging is primarily a function of volume of material to be removed, production rate, and the length of the dredging window. This memo focuses on the production rate.

FS Information. FS assumptions on production rates are included in Section 7.5. The production rate used in the FS calculations is 700 cy/day per dredge plant. That value is based on a theoretical efficiency analysis and comparisons to other dredge projects:

> *"Theoretical Efficiency Analysis: Assuming cycle times of 3 to 3.5 minutes, 10-cy buckets, 50 to 75 percent full, operating 10 to 12 hours per day with an effective work time of 50 to 60 percent estimated daily production ranges from 500 to 1,100 cy per day.*
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> *– Evaluating Similar Environmental Dredging Projects: Three recent environmental mechanical dredging projects have been completed in the Portland Harbor area: dredging at the NW Natural Gasco facility in October 2005, dredging at the Port of Portland Terminal 4 facility in summer 2008, and dredging at the Alcoa facility in Vancouver, Washington, in fall 2009. All three projects involved mechanical dredging with similar size dredge bucket and upland disposal. The daily dredging production rates ranged from 500 to 900 cy per day." Three dredge plants are assumed.*
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> *"A target of three independent remediation dredge plants would be operating at one time within the Portland Harbor Site on work associated with the project. This assumption is based on optimum likely contractor availability."*

Evaluation. The theoretical efficiency analysis was a generic evaluation without detailed consideration of site-specific conditions. A detailed analysis would consider many site-specific

conditions, such as depth of water, depth of cut, uniformity of cuts, contiguity of cuts, thickness of dredge prism, barge sizes, barge/tug availability (including unloading, processing and disposal capacity), grain size distribution of the sediment, liquidity of the sediment, debris removal/management effectiveness, employment of resuspension controls, silt curtain repositioning and maintenance requirements, currents, sediment contamination, allowable loss rates, mixing zone allowances, water quality standards, etc. Production rates from other sites should be adjusted based on consideration of these factors.

The analysis performed used a cycle time of 3 to 3.5 minutes; this is a very long cycle time that would only be used to control the allowable loss rate to meet a water quality criteria. A typical cycle time without restrictions would typically be more than 1.5 minutes or perhaps 2 minutes when dredging at depths greater than 35 ft. The fill percentage was cited as 50 to 75 percent, which tends to be representative of sites with shallow production cuts and a limited allowance for overdredging or stiff, dense sediments. A site-specific evaluation would allow an improved estimate of this parameter. The theoretical efficiency analysis uses 1 work shift per day, which is less than typically employed on large scale dredging projects in industrial/commercial settings. Most operations in a setting like Portland Harbor would operate 5.5 days per weeks, 20 to 24 hours per day. The effective work time is also a parameter that should be evaluated based on site-specific conditions. It is affected by barge sizes, barge/tug availability (including unloading, processing and disposal capacity), silt curtain use, silt curtain repositioning and maintenance requirements, contiguous volume to be dredged, cut uniformity, cut depth, debris management effectiveness, etc.

In comparisons with other projects, the impacts of site-specific factors along with unloading, processing and disposal bottlenecks were not considered. Assuming shore-based capacity for greater volumes, more than three dredge plants could operate simultaneously, although impacts to water quality would need to be evaluated. For example, the Hudson River (albeit, a considerably longer site) has approximately 5 dredge plants working simultaneously. At that site, storage capacity exists to lessen bottlenecks in transporting materials.

Production rates at numerous other sites have been much greater than 700 cy/day/dredge plant. At Buffalo River, a 15-cy mechanical dredge averaged 6500 cy/day for a 24-hr daily operation with a hydraulic off-loader disposing into a CDF. At Indiana Harbor, a 15-cy mechanical dredge averaged 5000 cy with significant debris problems for a 24-hr day with a hydraulic off-loader disposing into a CDF. At the Hudson River during Phase 2, 5-cy mechanical fixed-arm dredges averaged about 900 cy per 24-hour work days with shallow water, shallow cuts, small barges, long haul distances, lots of monitoring and confirmation requirements, essentially two shallow cleanup passes, and lots of traffic and coordination requirements.

Recommendation. A work schedule of 6 days at 24 hours/day with three dredge plants on site is recommended, equating to approximately 5,600 cubic yards per day with current production assumptions. To further refine this estimate, the cycle time, fill percentage and effective work time should be reviewed based on site-specific conditions, resuspension control plan and residuals management plan. The existing estimates for these parameters are conservative and typical of shallow cuts with stringent controls on overdredging, resuspension (e.g., silt curtains), and residuals. For example, thicker cuts could significantly increase the production rate. A target production rate of 6000 cy/day, 6 days per week should be achievable even with the assumed efficiency impacts of resuspension control and residuals control and management if water quality, processing and disposal requirement can be met.